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SILVICAL CHARACTERISTICS of HACKBERRY

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This is the last in a series of 17 papers dealing with the silvical characteristics of forest trees important in the Central States region. The following species are included in this series.

Ohio buckeye
Yellow buckeye
Northern red oak
Black oak
Chinkapin oak
Pin oak
White oak
Swamp white oak
Bur oak
Butternut
Black walnut
Shellbark hickory
Sycamore
Honeylocust
Hackberry
Black locust
Eastern redcedar

Papers covering additional important American species will be issued by other Forest Experiment Stations of the U. S. Forest Service.

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Silvical Characteristics of Hackberry

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Hackberry (Celtis occidentalis L.) is a small to medium-sized tree, known also as common hackberry, sugarberry, nettletree and false elm (4, 15). It is of minor importance as a timber tree. Throughout its range hackberry is found on a variety of sites (4, 8, 10, 15). A related species, sugarberry (C. laevigata Willd.), is commonly called hackberry, so it is probable that the southern range shown on the next page is not entirely accurate.

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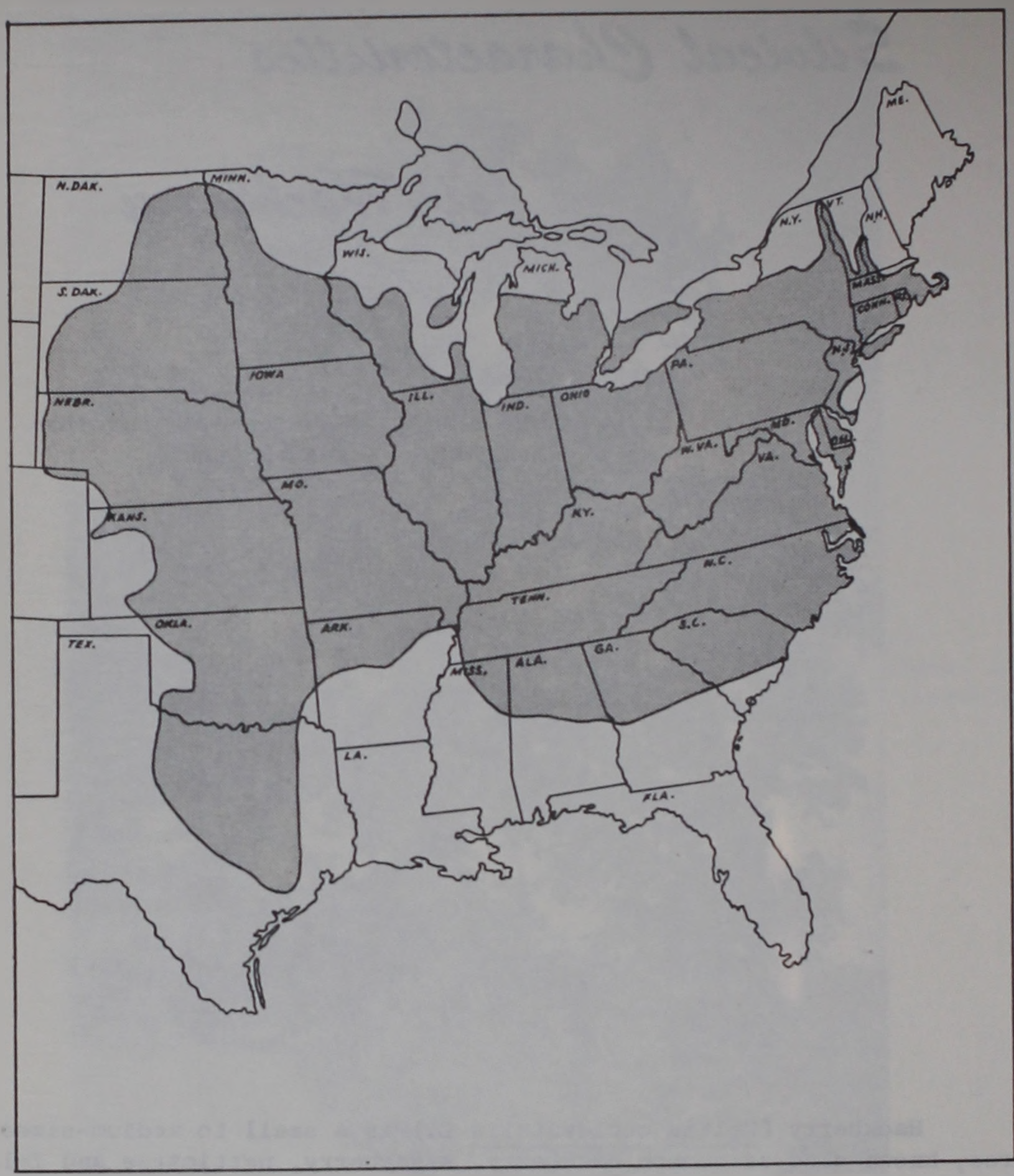

SITE

Climate

The wide distribution of hackberry demonstrates its capacity to withstand a variety of climatic conditions. Annual precipitation ranges from 14 inches on the Great Plains to 60 inches in southeastern United States. The monthly distribution of precipitation and the form in which it falls differ greatly (18, 29).

Hackberry is subjected to great extremes of temperature in the Great Plains, where an annual variation of 140 degrees or more is not uncommon. Temperatures are more moderate in the southeastern portion of its range. The length of frost-free season varies from 120 to 250 days (29).

Soils

The species is also well adapted to soil variations. Although principally a bottomland tree, it is found frequently on limestone outcrops or limestone soils (7, 10, 25, 27). In Pennsylvania, hackberry reproduction was most abundant on a forest soil which had the highest pH of five soils tested (11). In western Nebraska it grows on old blowouts on the north side of sand dunes, and in river valleys (26).

Sites with a very high water table are unfavorable, although periodic flooding apparently is not detrimental (27). In Kentucky, 46 days of flooding during one growing season caused no apparent damage (9). In Illinois, permanent flooding 3 feet deep killed hackberry in less than 4 years. Where only mud was present, 79 percent of the trees were dead at the end of 6 years (34). It has been observed that submergence for short periods causes heavy mortality of seedlings.

Physiography

Hackberry grows best on the rich, moist soils common in stream valleys (10, 27), but throughout much of its range it is common on slopes and bluffs (7, 19). In the western part of its range, however, it is restricted to well-developed river valleys, north slopes, and protected ravines, and is largely absent from wind-swept portions of the western river valleys (1, 26, 32). In north-central Arkansas, hackberry is confined to the "gulch" type (3). It is common in eastern Iowa on all bottomland sites except the wettest, and on upland sites as reproduction and saplings under existing oak stands on all aspects, slopes, and ridges.

Associated Species

Hackberry generally occurs as scattered trees in mixture with other hardwoods (2, 10). It becomes prominent in the hackberry-American elm- green ash type, replacing sugarberry in the northern part of the type range. Otherwise it is listed by the Society of American Foresters (25) as only a minor component in six upland forest types.

In Illinois, it has been mentioned as an associate in the basswood-elm and the elm-sycamore-maple associations (16). It undoubtedly may be found in a number of other central hardwood types but is not recognized as a component because of its infrequent occurrence. Some of the many associates of hackberry are oaks, hickories, green ash, and American elm.

Hackberry is a source of food for wildlife. In Kansas, the fox squirrel feeds on both the nipple galls and the fruit (5). The fruit is eaten also by many species of birds, including quail, ring-necked pheasant, wild turkey, cedar wax-wing, prairie sharp-tailed grouse, yellow-bellied sapsucker, mockingbird, and robin (17, 31). On a dry-weight basis, the pulp of the fruit is almost half sugars and starches (5).

LIFE HISTORY

Seeding Habits

The flowers, which are sometimes perfect and sometimes unisexual on the same tree, are borne on drooping pedicels, appearing with or shortly after the leaves (10, 23, 30). Flowering occurs in early April in the southern portion of the range and in late May in the northern portion. The seed ripens in September and October, sometimes remaining on the tree until the following spring (13, 31). The fruit (a drupe) is usually 1/4 to 1/3 inch in diameter, dark red to purple, but variable in size, form, and color (10, 31).

Hackberry has good seed crops in most years, and light seed crops in intervening years (30). The seed is disseminated principally by birds and small mammals, but some seeds may be scattered by water (5, 10, 19, 32).

Vegetative Reproduction

Hackberry can be propagated by cuttings and by layering (29, 30). Stumps from small trees sprout, but those of larger trees rarely do so (10, 27).

Seedling Development

Little is known about the factors affecting establishment of hackberry. Average germinative capacity of the seed is 41 percent. Germination is best in rich, moist loam soils (30).

In eastern Iowa, the seedlings become established under existing hardwood stands, but rarely in old fields. In Illinois, however, the tree has been observed invading the prairie (33). In Pennsylvania, hackberry seedlings were observed in heavy shade, while seedlings of the other overstory species did not persist (11). On the other hand, on an Indiana floodplain, hackberry was the only tree of the principal crown cover that had a high rate of mortality among its seedlings (14).

Early growth of hackberry varies greatly within its range and on different sites in a single locality. Under a heavy overstory, height growth may not exceed 1 inch per year. But under cultivation in the Great Plains shelterbelts, height growth during the first 6 years averaged 1.3 feet per year (18).

Sapling Stage to Maturity

Mature hackberry is usually a small to medium-sized tree, 30 to 50 feet tall and 18 to 24 inches in diameter. On the best sites, however, it may reach a height of 130 feet and a diameter of 4 feet (10, 23). Trees up to 4 feet in diameter and 95 feet tall have been observed in the western portion of its range (1, 32).

On the better alluvial soils, diameter growth may equal 1/3 of an inch annually, although usually it is much less. In the western portion of its range, an annual diameter growth of 1/5 of an inch has been observed. The most rapid growth period is between the 20th and 40th years. Maximum age is 150 to 200 years (4, 12, 27). On the poorer sites, growth is very slow and the trees are dwarfed (1).

Hackberry is considered to be either "intermediate" or "tolerant" in its ability to withstand shade (2, 4). It has been observed that trees suppressed for an extended period develop a poor form. Butt rot is rather common in suppressed trees, probably because of slow healing of wounds. When the tree is not suppreseed, it can compete successfully with many of the species with which it is found, such as the oaks on the upland, and elms and hickories on the floodplains.

Because of the scattered occurrence of hackberry in many forest types ranging from temporary to subclimax, the successional position is difficult to determine. On most sites where small, nearly pure stands of hackberry are found, it probably is a temporary type only.

ENEMIES AND HAZARDS

Insects

Hackberry is the host of four gall-producing species (Pachypsyll celtidis-gemma, P. celtidis-mamma, P. celtidis-vesicula, and P. venusta (6). The adults pass the winter in cracks of the bark or among the debris on the ground, and in the spring lay eggs on the leaves. The damage is not serious (28).

The spiny elm caterpillar (Euvanessa antiopa) and the caterpillar of hackberry butterfly (Chlorippe celtis) feed on the leaves. The amount of injury depends on the number of caterpillars present; when abundant, they may defoliate entire branches and trees (28).

Other insects found on hackberry are Agrilus celti and A. lecontei, Aspidiotus ancylus, Asterocampa celtis and A. clyton, Cnidocampa flavescens, Nymphalis antiopa, Pantomorus leucoloma, Phythorophloens dentifrons, Pseudothysanoes lecontei, Pulvinaria vitis, Scolytus fagi, and Strongylium terminatium (6).

Diseases

Powdery mildew (Sphaerotheca phytoptophila) vectored by a mite (Eriophyes spp.), and several leaf-spot fungi are common on hackberry trees, but the most important disease is "witches' broom", which causes a rosette-like proliferation of the branch tips (7, 31). The species is highly susceptible to fire damage, which opens the way for wood decay organisms (22).

The hackberry engraver beetle (Scolytus muticus) normally attacks only dead or dying branches (6), but has been reported to have attacked the living sapwood, causing the tree to die (21).

Weather

The species is considered drought-resistant and has survived extremely dry periods in the Great Plains (19, 31). During the severe drought of 1934 in western Kansas, hackberry survived better than American elm and honeylocust, equal to boxelder and black locust, but somewhat poorer than bur oak and redcedar (1).

RACES AND HYBRIDS

Considering the wide range of hackberry, it is probable that races exist, although none have been recognized. No hybrids have been reported.

Three varieties have been recognized in the past (19, 30): C. occidentalis var. canina Raf. is reportedly taller than the true species; C. occidentalis var. crassifolia has not been recognized as a true variety by some; C. occidentalis var. pumila is a shrub or small tree of usually exposed habitats. However, Little (15) contends that "since the species. . .are not well defined, it seems unnecessary to distinguish minor variations as varieties."

SPECIAL FEATURES

The "witches' brooms" which commonly occur on hackberry may, in some instances, be considered desirable characteristics, when the tree is planted for ornamental purposes. The "warty" bark also adds to its aesthetic value.

TREE SPECIES MENTIONED

Green ash	-	Fraxinus pennsylvanica Marsh.
Boxelder	-	Acer negundo L.
American elm	-	Ulmus americana L.
Hackberry	-	Celtis occidentalis L.
Hickories	-	Carya spp.
Honeylocust	-	Gleditsia triacanthos L.
Black locust	-	Robinia pseudoacacia L.
Bur oak	-	Quercus macrocarpa Michx.
Redcedar	-	Juniperus spp.
Sugarberry	-	C. laevigata Willd.

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